Simulations of the Aerosol Index and the Absorption Aerosol Optical Depth and comparisons with OMI retrievals during ARCTAS-2008 campaign

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We have computed the Aerosol Index (AI) at 354 nm, useful for observing the presence of absorbing aerosols in the atmosphere, from aerosol simulations conducted with the Goddard Chemistry, Aerosol, Radiation, and Transport (GOCART) module running on-line the GEOS-5 Atmospheric GCM. The model simulates five aerosol types: dust, sea salt, black carbon, organic carbon and sulfate aerosol and can be run in replay or data assimilation modes. In the assimilation mode, information's provided by the space-based MODIS and MISR sensors constrains the model aerosol state. Aerosol optical properties are then derived from the simulated mass concentration and the AI is determined at the OMI footprint using the radiative transfer code VLIDORT. In parallel, model derived Absorption Aerosol Optical Depth (AAOD) is compared with OMI retrievals. We have focused our study during ARCTAS (June – July 2008), a period with a good sampling of dust and biomass burning events. Our ultimate goal is to use OMI measurements as independent validation for our MODIS/MISR assimilation. Towards this goal we document the limitation of OMI aerosol absorption measurements on a global scale, in particular sensitivity to aerosol vertical profile and cloud contamination effects, deriving the appropriate averaging kernels. More specifically, model simulated (full) column integrated AAOD is compared with model derived AI, this way identifying those regions and conditions under which OMI cannot detect absorbing aerosols. Making use of A-Train cloud measurements from MODIS, CloudSat and CALIPSO we also investigate the global impact on clouds on OMI derived AI, and the extent to which GEOS-5 clouds can offer a first order representation of these effects.